

What is claimed is:

1. A method for drill guidance, comprising:
  - determining a planned path for a borehole;
  - positioning a localized magnetic field source with respect to said planned path;
  - orienting said field source with respect to gravity;
  - causing said source to generate first and second magnetic fields of alternating polarity;
  - measuring, at a measurement location in a borehole being drilled, the vector components of said first and second magnetic fields and the vector components of gravity at the measurement location; and
  - determining the distance and direction between the measurement location and the magnetic field source;
2. The method of claim 1, further including:
  - determining from said distance and direction, and from the planned path of the borehole, the direction of drilling of the borehole.
3. The method of claim 1, wherein said field source is a solenoid having an axis, and wherein orienting said field source includes leveling said solenoid to cause said solenoid axis to be oriented with respect to a horizontal plane.
4. The method of claim 3, wherein said solenoid is rotatable in said horizontal plane, and wherein generating first and second direct current magnetic fields includes:
  - fixing said solenoid at a first rotational point and energizing said solenoid to generate said first magnetic field; and
  - rotating said solenoid to a second rotational position substantially perpendicular to said first position and energizing said solenoid to generate said second magnetic field.

5. The method of claim 4, wherein energizing said solenoid includes supplying to the solenoid a reversible direct current.

6. The method of claim 5, wherein energizing said solenoid includes reversing said direct current at a fixed rate.

7. The method of claim 1, wherein said field source includes first and second mutually perpendicular solenoids, and wherein orienting said field source includes leveling said solenoids with respect to a horizontal plane.

8. The method of claim 7, wherein generating said first and second magnetic fields includes energizing said solenoids.

9. The method of claim 8, wherein energizing said solenoids includes supplying to each solenoid a reversible direct current.

10. The method of claim 9, wherein energizing said solenoids further includes reversing said direct current at a fixed rate.

11. The method of claim 10, wherein determining said distance and direction includes generating a reference waveform synchronized with said periodic reversal of said magnetic fields and signal averaging the measured magnetic field vector components.

The method of claim 11, wherein determining said distance and direction ~~further~~ includes computing the vertical angle between said source location and said measurement location and computing therefrom the vector from said measurement location to a selected location on said planned path.

13. The method of claim 12, further including determining from said distance and direction and from the planned path of the borehole the direction of drilling of the borehole.

14. The method of claim 10, further including determining from said distance and direction and from the planned path of the borehole, the direction of further drilling of the borehole.